JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1981, 14, 3-12 NUMBER 1 (SPRING 1981)

NORMAL PEER MODELS AND AUTISTIC CHILDREN'S LEARNING

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Present research and legislation regarding mainstreaming autistic children into normal classrooms have raised the importance of studying whether autistic children can benefit from observing normal peer models. The present investigation systematically assessed whether autistic children's learning of discrimination tasks could be improved if they observed normal children perform the tasks correctly. In the context of a multiple baseline design, four autistic children worked on five discrimination tasks that their teachers reported were posing difficulty. Throughout the baseline condition the children evidenced very low levels of correct responding on all five tasks. In the subsequent treatment condition, when normal peers modeled correct responses, the autistic children's correct responding increased dramatically. In each case, the peer modeling procedure produced rapid achievement of the acquisition criterion which was maintained after the peer models were removed. These results are discussed in relation to issues concerning observational learning and in relation to the implications for mainstreaming autistic children into normal classrooms.

DESCRIPTORS: modeling, mainstreaming, stimulus control, peer models, autistic children

The passage of federal legislation mandating public education in the least restrictive environment, and the development of procedures for teaching classroom skills to autistic children (Hamblin, Buckholdt, Ferritor, Kozloff, & Blackwell, 1971; Koegel & Rincover, 1974; Kozloff, 1974; Martin, England, Kaprowy, Kilgour, & Pilek, 1968; Rabb & Hewett, 1967; Rincover & Koegel, 1977) have begun to stimulate considerable research concerning the education of autistic children. Of particular importance is the question of whether autistic children should be integrated into educational settings with normal children (Russo & Koegel, 1977). As more autistic children are being placed into the "educational mainstream," an important consideration is whether or not the nonhandicapped peers in the classroom can serve as role models for appropriate behavior.

Extensive work by a number of investigators examining observational learning has demonstrated that peer models for normal children have effected change in a variety of behaviors. These behaviors have included sharing (Elliot & Vasta, 1970; Hartup & Coates, 1967; Igelmo, 1976); sex role behaviors (Kobasigawa, 1968; Miran, 1975); self-reinforcement (Bandura & Kupers, 1964); problem-solving (Clark, 1965; Debus, 1970; Ridberg, Parke, & Hetherington,

This research was supported in part by U. S. Public Health Service Research Grants MH 28210 and MH 28231 (Robert L. Koegel and Laura Schreibman, principal investigators) from the National Institute of Mental Health; U. S. Office of Education Research Grant G007802084 (Robert L. Koegel and Arnold Rincover, principal investigators) from the Bureau of Education for the Handicapped; and by U. S. Office of Education Model Demonstration Grant No. G008001720 (Andrew L. Egel, principal investigator) from the Bureau of Education for the Handicapped. The authors are grateful to Debbie Stevens and Jean Johnson for their assistance throughout this investigation. Requests for reprints should be addressed to Andrew L. Egel, Department of Special Education, University of Maryland, College Park, Maryland 20742.

1971); and emotional behaviors (Bandura, Grusec, & Menlove, 1967; Bandura & Menlove, 1968).

The beneficial effects of peer modeling with normal children has invited serious consideration of the possibility that such models might also facilitate learning in handicapped children (Snyder, Apolloni, & Cooke, 1977). Only recently, however, has this concept received any empirical support (Apolloni, Cooke, & Cooke, 1976; Barry & Overman, 1977; Peterson, Peterson, & Scriven, 1977; Rauer, Cooke, & Apolloni, 1978; Talkington, Hall, & Altman, 1973). These studies demonstrated that the responses (e.g., verbal behavior) of retarded children could be brought under the stimulus control of a peer model's behavior.

Fewer studies have been conducted that systematically examine observational learning with autistic children. However, there have been some suggestions that normal peer models might be helpful for this population. For example, Coleman and Stedman (1974) described a case history in which a normal peer seemed to serve as a model to modify voice loudness and increase the labeling vocabulary of an autistic child. Other studies, however, have suggested that such positive benefits may not be possible for all autistic children or with all types of models. For example, in a systematic assessment of observational learning with 15 autistic children and adult models, Varni, Lovaas, Koegel, and Everett (1979) found that very low functioning autistic children acquired only a small portion of adult modeled responses. Varni et al. suggested that stimulus overselectivity in lower functioning autistic children may have accounted for those children's failure to learn through observation. They also suggested the possibility that this problem may be less severe for higher level autistic children.

In view of the above studies, it seemed plausible that at least some autistic children should be able to benefit from exposure to normal peer models. The present study was therefore designed to test this hypothesis systematically.

METHOD

Subjects

Four autistic children participated in this investigation. They were selected because they were having particular difficulty acquiring certain tasks in their ongoing (special education) classroom curricula in spite of making general overall progress. Specific characteristics for each child are described below.

Child 1 was 5 yrs old at the time of the study. He displayed mild to moderate amounts of self-stimulatory behaviors (finger-flapping, rocking), and had occasional tantrums. He was severely deficient in areas such as appropriate play, social behavior, and self-help skills. Although he continued to display numerous autistic behaviors, he was beginning to make progress in preacademic skills in his school program including simple match to sample and sequencing. In addition, he had acquired a relatively large basic imitative verbal and nonverbal repertoire and was beginning to acquire a small (50-100 word) functional vocabulary. This child's responses on verbal IQ tests were too inconsistent to give meaningful results. However, his estimated nonverbal IQ on the Leiter International Performance Scale was 50.

Child 2 was 6 yrs, 2 mos old when this study was conducted. She was completely nonverbal, engaged in moderate to low amounts of self-stimulatory behavior (head weaving, eye gazing), and was severely deficient in areas such as appropriate play, social behavior, and self-help skills. She had acquired a relatively large basic nonverbal imitative repertoire and was beginning to work on a variety of preacademic tasks, including simple match to sample, and form discrimination tasks in her school program. This child's responses were too inconsistent on verbal IQ tests to give meaningful results. However, she was estimated by teachers and psychologists to be functioning nonverbally at the 3.5-yr-old level.

Child 3 was 7 yrs, 1 mo old at the time of the study. He displayed moderate to low

amounts of self-stimulatory behaviors (tapping objects, smelling objects), and was functioning considerably below his age level in such areas as appropriate play (engaging essentially in solitary play), and social behavior. His speech was primarily echolalic, although he had a relatively large basic verbal and nonverbal imitative repertoire and was beginning to develop a small (150-200 word) functional vocabulary. He was also making progress in a variety of preacademic skills including simultaneous form and color discriminations, beginning Distar reading, and pre-math concepts. His responses on verbal IQ tests were still too inconsistent to give meaningful results. However, teachers and psychologists estimated him to be functioning nonverbally at the 5-yr-old level.

Child 4 was 7 yrs, 9 mos old at the time of the study. Her speech was primarily echolalic but she had an extensive verbal and nonverbal imitative repertoire and was developing an increasing vocabulary of functional speech. She had moderate amounts of self-stimulatory behaviors (head shaking, clicking, gazing), and had occasional tantrums. Her school curriculum included a variety of preacademic skills in which she was making considerable progress (pre-reading, pre-math concepts, following two-part instructions). Teachers and psychologists estimated this child to be functioning at about the 5-yr-old level, with isolated splinter skills. She achieved a full scale IQ score of 55 on the Wechsler Intelligence Scale for Children (WISC-R), a Social Quotient of 97 on the Vineland Social Maturity Scale, and a nonverbal IQ of 78 on the Leiter International Performance Scale.

Peer Models

Three normal children from neighboring classrooms served as peer models. In addition, one very high functioning autistic child who functioned normally with respect to several tasks, served as a model for Child 3/Task 2. The models were chosen to be of the same (or no more than 2 yrs older) chronological ages as the autistic subjects. They were selected for their responsiveness to adults' requests and their ability to complete the tasks employed in this investigation. All the peer models were functioning substantially above the level of the autistic children who observed them (see Table 1).

Experimental Setting

All sessions were conducted in a 2.4 m × 2.4 m (8 × 8 ft) area of the special education classrooms the autistic children were attending. Sessions ranged in length from 5 to 15 min with no more than two sessions per day and no more than three days between sessions. Typically 10-40 trials were conducted per session. The therapists were the second author (for Child 3 and Child 4) and an advanced undergraduate (for Child 1 and Child 2) who was naive with

Table 1

Descriptions of the Autistic Children and Their Respective Peer Models

	AUTISTIC CHILDREN			*NORMAL PEERS*	
	*CA***	*Sex*	*Estimated level of functioning***	*CA***	*Sex*
Child 1	5.0	Male	2.6	6.0	Male
Child 2	6.2	Female	3.6	6.0	Male
Child 3/Task 1	7.1	Male	5.0	8.6	Male
Child 4	7.9	Female	5.0	9.0	Female
Child 3/Task 2	7.1	Male	5.0	7.9	Female*

*This child was autistic but had achieved normal functioning with respect to this target behavior.

**Given in yrs and mos.

respect to the experimental hypothesis. Each had at least 3 yrs' experience in the use of behavior modification techniques with autistic children.

Target Behaviors

The target behaviors in this investigation were selected for each child from his or her present school curriculum. In each case, the classroom teachers noted that the children were functioning at high levels in some curricular domains, but the specific activities chosen for this investigation had been particularly difficult for these children. The specific target behaviors are described in detail below.

Child 1/Task 1. The task for this child was a color discrimination. Two colored crayons (red and blue) were placed on the table in front of the child and the therapist presented the instruction, "Give me red (blue)." The child was then required to hand the appropriate colored crayon to the therapist within 5 sec. An equal number of trials was conducted for each stimulus object (red or blue), with the position and order of presentation randomly determined.

Child 2/Task 1. This task consisted of the discrimination of square vs. circle. A square and a circle were placed in front of the child and the instruction, "Give me square (circle)," was presented. The child was then required to hand the therapist the appropriate object within 5 sec. Each object (circle vs. square) was requested on an equal number of trials in a randomized order.

Child 3/Task 1; Child 4/Task 1. These two children worked on similar tasks, consisting of learning to discriminate between the prepositions on vs. under. On each trial, the child was presented with a stimulus picture (e.g., a picture of a girl on or under a chair) and the therapist asked the question, "Where is the (girl)?" The child was then required to respond within 5 sec by answering with the appropriate preposition (e.g., "on the chair"). An equal number of trials was conducted for each preposition, with the order of presentation randomly determined.

Child 3/Task 2. This task required the child to make the response of "yes" or "no" to questions of affirmation. A stimulus picture (e.g., a picture of a house) was presented to the child, and the therapist asked a question such as, "Is this a house (dog, etc.)?" The child was then required to respond appropriately ("yes" or "no") within 5 sec. An equal number of yes/no trials were presented in a random order.

Design

A multiple baseline design across subjects (Hersen & Barlow, 1976) was used to assess whether peer models might facilitate the learning of the above tasks. The design included two tiers of different behaviors for one child (Child 3/Tasks 1 and 2) and two tiers of the same behavior for two children (Child 3/Task 1; and Child 4).

The *baseline (no modeling) condition* involved no changes from the regular teaching procedures used in the classroom. These procedures were based on the format delineated by Koegel, Russo, and Rincover (1977). Typically the therapist waited until the child was quiet and attending and then presented an instruction (see above). Correct responses were reinforced with social praise (e.g., "good boy") and/or edibles, while incorrect responses were followed by a verbal "no." Prompt fading procedures (e.g., manually guiding the child's hand or verbally prompting a correct response) were used if the child was incorrect for approximately three successive trials. This method of instruction has been described in detail in numerous research publications (Dunlap, Koegel, & Egel, 1979; Koegel, Egel, & Dunlap, 1980; Lovaas & Newsom, 1976; Schreibman & Koegel, in press). The baseline condition was maintained for 20, 30, 40, 60, and 130 trials for each child/task combination, respectively (see Figure 1).

During the *modeling condition,* the identical teaching procedures used during the baseline

condition continued, except that the therapist had a normal child model correct responding. Each trial began with the teacher instructing the autistic child to look at the stimulus materials, while a peer, seated across from or to the side of the autistic child, modeled the appropriate response to the therapist's instruction. The therapist then reinforced the peer's behavior, and then subsequently presented the same instruction and stimulus materials to the autistic child. The autistic child's responses were consequated by the therapist in the same manner described above in the no modeling (baseline) condition. A task for this investigation was considered acquired if the autistic child responded correctly for 8 out of a given block of 10 unprompted trials.

Additional no-modeling trials. Two days after a child reached the acquisition criterion, an additional 30 "no-modeling" trials were conducted to determine whether the autistic child's responding would be maintained in the absence of the peer model. These trials were conducted in the identical manner described in the original no-model (baseline) condition.

Data Recording and Reliability Assessment

Every trial was scored by the therapist as correct or incorrect as defined above. Reliability measures were taken randomly on 80% of the total trials by an independent observer who was naive with respect to the experimental hypothesis. Percent agreement (for occurrences and nonoccurrences) was calculated by dividing the total number of agreements (identical recordings by both observers on a given trial) by the total number of agreements plus disagreements in each session and multiplying by 100. The percent agreement between observers (calculated separately for occurrences and nonoccurrences) was 100% in every session.

RESULTS

Figure 1 presents the results of the multiple baseline analysis. Blocks of 10 trials are plotted along the abscissa with the percent correct unprompted trials on the ordinate.

In the baseline condition (no model), all four children evidenced very low levels of correct responding. Regardless of the number of trials presented, all four children failed to reach the acquisition criterion on any of the tasks. For example, Child 1 averaged chance level (50%) correct responding for 20 trials; Child 2 averaged 33% (range: 20% to 40%) correct responding for 30 trials; Child 3/Task 1 averaged 40% correct responding for 40 trials; Child 4 averaged 25% (range: 10% to 40%) correct responding for 60 trials; and Child 3/Task 2 averaged 24% (range: 10% to 40%) correct responding for 130 trials.

With the introduction of the treatment condition (modeling), all four children's correct responses increased dramatically. Inspection of the graph shows that in this condition, both Child 1 and Child 2 reached the acquisition criterion within 20 trials; Child 3 (Task 1) immediately surpassed the 80% criterion, by responding with 100% accuracy in the first block of 10 trials; Child 4 also attained the acquisition criterion within the first block of trials; and Child 3 (Task 2) achieved the acquisition criterion within 20 treatment trials.

In order to assess whether the autistic children's correct responding would be maintained in the absence of the peer model, an additional 30 trials were conducted without the model present. In this final no-modeling condition, which was conducted 2 days later, all four children showed continued high levels of correct responding. Child 1 stabilized at 100% correct responding; Child 2 averaged 93% (range: 90% to 100%) correct responding; Child 3/Task 1 stabilized at 100% correct responding; Child 4 averaged 97% (range: 90% to 100%) correct responding; and Child 3/Task 2 stabilized at 80% correct responding.

In *summary,* during the baseline condition (no model), all of these children were responding around chance level with no block of 10 trials ever above 50%. In marked contrast, the correct responding during the treatment condition (model) was always considerably above the

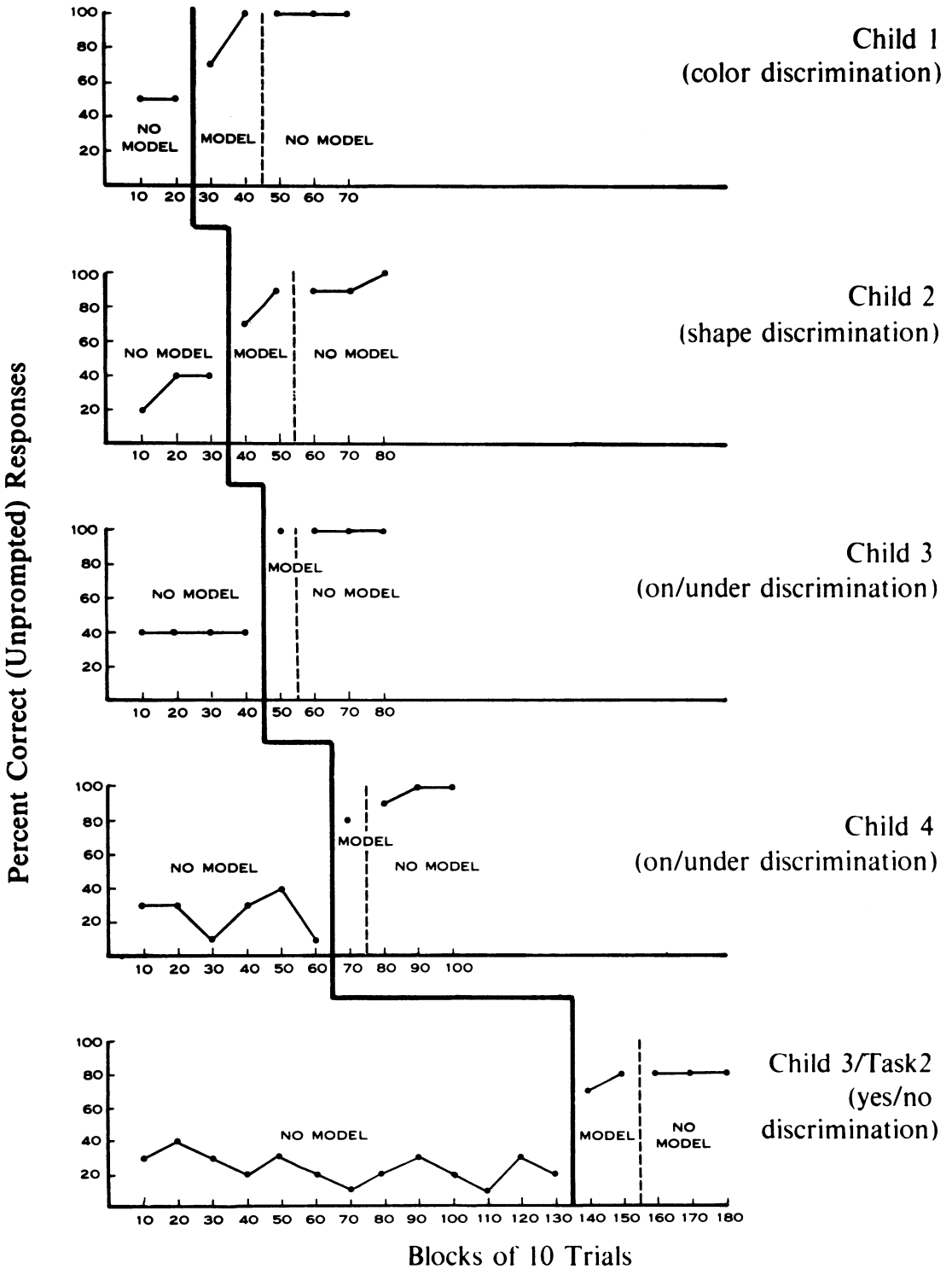

Fig. 1. The multiple baseline analysis of the influence of peer models on the autistic children's behaviors.

baseline level with rapid acquisition of the 80% criterion. Further, when the models were removed, the autistic children maintained their high levels of correct responding.

DISCUSSION

The purpose of this study was to assess the effect of peer models in facilitating autistic children's learning. The results clearly demonstrated that, for the autistic children in this study, correct responding on all of the discrimination tasks was greatly improved when peers (especially normal peers) modeled correct responses.

Pretraining and Developmental Level

It should be noted, however, that the autistic children in this investigation differed significantly from some of the autistic children in previous studies on observational learning. For example, many of the children in the Varni et al. (1979) investigation were described as functioning at a level of severe behavioral retardation, exhibiting very minimal expressive or receptive speech, and engaging in high rates of self-stimulation. The children who participated in the present investigation, although having serious learning impairments, were not among the most severe of the autistic population. All the children had well developed imitative repertoires, were beginning to acquire a small functional expressive vocabulary (with the exception of Child 2), and had relatively large basic receptive language abilities (e.g., were able to follow two- and three-part commands). Thus, it is possible that certain types of pretraining may be necessary before autistic children can benefit from exposure to normal peer models (cf. Russo & Koegel, 1977).

A related consideration concerns the fact that the children in this investigation had IQ scores ranging from 50 to 87. When one considers this fact in the light of articles relating observational learning to IQ and/or maturational level (e.g., Lovaas, Koegel, & Schreibman, 1979; Ross, 1976; Varni et al., 1979), it seems conceivable that the present findings that autistic children are able to learn through observation may need to be qualified in terms of these children's level of functioning. That level, however, is typical of a very large proportion of the autistic population, who are currently being excluded from interactions with normal peers.

Similarity of Model to Learner

Other factors may also have influenced the results. For example, in this investigation, the models were all chosen to be of approximately the same age as the autistic children. Several investigators working with other populations of children have noted that, for some responses, peers may be more effective models than adults (e.g., Barry & Overman, 1977; Hicks, 1965; Kazdin, 1974; Kornhaber & Schroeder, 1975). It is thus possible that such variables as the age and sex of the model and observer may directly affect the probability of the model being imitated (Bandura, Ross, & Ross, 1963; Hartup & Lougee, 1975; Rosekrans, 1967). This may explain why, in the baseline, the therapists' prompts were ineffective while the use of the peer models facilitated correct responding. Similar facilitative effects have also been found when peers were used as tutors (Norris, Note 1; Ragland, Kerr, & Strain, 1978; Strain, Kerr, & Ragland, 1979). In these studies, however, observational learning was not assessed.

Novelty

It also seems plausible that the models may have served to increase the saliency of the required response and reinforcer by adding novelty to the situation. Novelty, as many investigators have noted, serves to enhance attentional skills (Berlyne, 1960; Berlyne & Ditkofsky, 1976; Dunlap & Koegel, 1980; Egel, 1980; Hutt, 1975). This possibility seems particularly encouraging in that it relates to a large literature describing a characteristic difficulty in directing autistic children's responding to relevant cues (cf. Koegel, Dunlap, Richman, & Dyer, in press; Koegel & Schreibman, 1977; Lovaas et al.,

1979; Ornitz & Ritvo, 1968; Rincover, 1978; Schopler, 1965; Schreibman, 1975).

Classroom Implications

Whatever the reason for the present results, the data imply that moderately impaired autistic children, who are presently placed in segregated classrooms for the severely handicapped, could benefit from the opportunity to observe normal peers. This suggests that it may be important to consider integrating at least some autistic children into classrooms with nonautistic (or normal) peers as has been encouraged by Christoplos (1973) and by Dunlap et al. (1979). Russo and Koegel (1977) have reported data suggesting that such integration is possible for many autistic children. Further, two of the children in the present investigation have now been partially integrated into normal classrooms. For each of these children, teachers and observers have noted numerous instances of the autistic children imitating the normal peers.

Although such reports are extremely encouraging, the ability to learn from observation may not be sufficient for successful integration. Other factors such as the child's language abilities, the effects of autistic children on the normal peers (e.g., McHale & Simeonsson, 1980), the children's overall functioning level, and the level of the classroom teacher's sophistication in the use of behavioral techniques (e.g., Russo & Koegel, 1977), may be important areas for future research if we are to expect significant gains from mainstreaming autistic children (Kaufman, Gottlieb, Agara, & Kukic, 1975; Meisels, 1977; Pappanikou & Paul, 1977). The present investigation implies that there will be at least some positive benefits from placing autistic children with normal children, and the data urge the continuation of efforts to evaluate such placements in a serious and comprehensive manner.

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Received February 27, 1980
Final acceptance August 14, 1980